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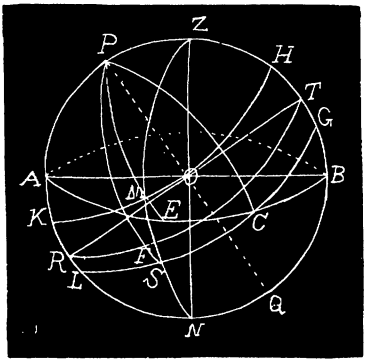
PMZ, $PZ=90^\circ-\lambda_1$, $ZM=90^\circ$, $PM=90^\circ-\delta$. Let $\angle ZPM=h$, $\angle PZM=z$, $ZPC=h_1$, $\angle ZPS=\beta$.



Then $\cos h=-\tan\lambda\tan\delta=-\tan 40^\circ\tan 5^\circ 23'$. $\therefore h=94^\circ\ 32'\ 6.8''$.

$\sin z=\cos\delta\sin h$. $\therefore z=82^\circ\ 57'\ 54''$.

$\cos h_1=-\tan\lambda\tan\delta_1$. $\therefore h_1=81^\circ\ 36^\circ\ 29$.

In triangle ZPS, $PS=90^\circ+\delta_1$, $PZ=90^\circ-\lambda$. $\angle PZS=z$.

$\sin PSZ=(\sin z\cos\lambda)/\cos\delta_1$. $\therefore PSZ=\lambda_1=50^\circ\ 30'\ 22''$.

$$\cot\tfrac{1}{2}\beta=\frac{\sin\frac{1}{2}(180^\circ-\lambda+\delta_1)}{\sin\frac{1}{2}(\lambda+\delta_1)}\tan\tfrac{1}{2}(z-\lambda_1).$$

$\therefore \beta=112^\circ\ 36'\ 47''$.

β=Sun's hour angle at moonset ; h_1= Sun's hour angle at sunset ; $\beta-h_1=31^\circ\ 0'\ 18''$=2 hours, 4 minutes, 1.2 seconds after sunset.

PROBLEMS FOR SOLUTION.

ARITHMETIC.

89. Proposed by NELSON S. RORAY, South Jersey Institute, Bridgeton, N. J.

Solve by pure arithmetic. A criminal having escaped from prison traveled 10 hours before his escape was known; he was then pursued so as to be gained upon 3 miles an hour: after his pursuers had traveled 8 hours they met an express going at same rate as themselves, who had met the criminal 2 hours and 24 minutes before; in what time from the commencement of the pursuit will they overtake him?

90. Proposed by F. M. PRIEST, Mona House, St. Louis, Mo.

A owes $6000 which is drawing 6% interest. He wishes to pay off the debt in six equal annual payments, the first to be due in one year. The whole portion of the claim unpaid at the end of each year to be accounted as principal, and to draw interest to the time of the next payment. Required the amount of each payment, so the six equal payments will discharge the obligation, interest and all.

91. Proposed by J. A. CALDERHEAD, M. Sc., Professor of Mathematics in Curry University, Pittsburg, Pa.

$1000.00. Cleveland, Ohio, May 26, 1893.

Two years after date I promise to pay John Davis, or order, one thousand dollars, for value received, interest six per cent. payable annually. J. M. Lewis.

Indorsements: December 14, 1895, $560.56; May 11, 1896, $10.02; June 14, 1697, $545.06.

Find, by the United States' Rule, the amount due August 2, 1897.

*** Solutions of these problems should be sent to B. F. Finkel, not later than March 1.